

## Aeroelastic Simulation Tool for Inflatable Ballute Aerocapture, Phase II

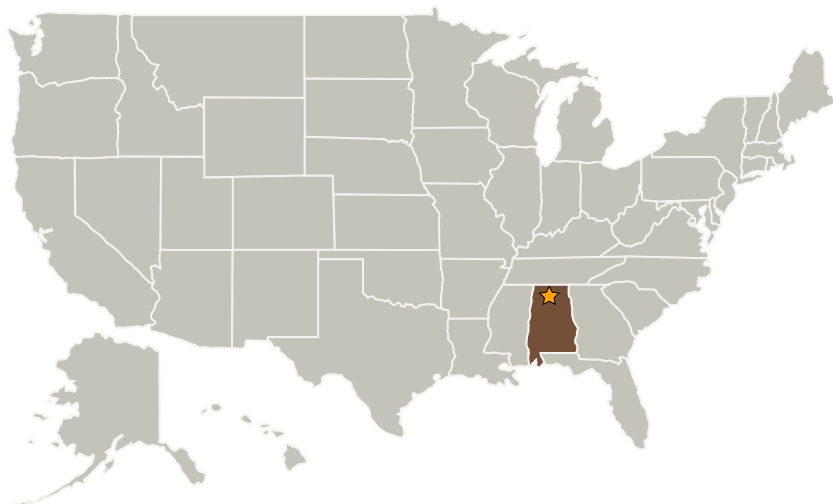
Completed Technology Project (2005 - 2007)



## Project Introduction

This project will develop a much-needed multidisciplinary analysis tool for predicting the impact of aeroelastic effects on the functionality of inflatable aeroassist vehicles in both the continuum and rarefied flow regimes. In this integrated multi-physics multi-disciplinary computing environment, high-fidelity modules for continuum and rarefied aerodynamics, stress, heat transfer, and computational grid deformation are coupled. This flexible and extensible approach allows the integration of state-of-the-art, stand-alone NASA and industry leading continuum and rarefied flow solvers and structural analysis codes into a computing environment in which the modules can run concurrently with synchronized data transfer. The Phase I study proved the feasibility of this approach. Tightly coupled fluid-structure continuum flow demonstrations were conducted on a clamped ballute configuration. The feasibility of implementing a DSMC flow solver in the simulation framework was demonstrated, and loosely coupled rarefied flow aeroelastic demonstrations were performed. A NASA and industry technology survey identified several software tools for fluid and structural modeling to be integrated into the environment. Phase II efforts will focus on full implementation of these tools. They include NASA-selected CFD and DSMC codes, and commercial leading structural analysis codes capable of modeling non-linear shape and material response of thin-film inflated aeroshells. Extensive verification and validation studies will be performed, and the software will be applied in ballute technology development.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Marshall Space Flight Center (MSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

## Primary U.S. Work Locations

Alabama

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX09 Entry, Descent, and Landing
  - └ TX09.4 Vehicle Systems
    - └ TX09.4.5 Modeling and Simulation for EDL